

Case 3579***Scarabaeus fimetarius* Linnaeus, 1758 (currently *Aphodius fimetarius*; Insecta, Coleoptera, SCARABAEIDAE): proposed conservation of usage of the specific name by designation of a neotype**

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Abstract. The purpose of this application, under Articles 75.5 and 75.6 of the Code, is to conserve the current usage of the name *Aphodius fimetarius* (Linnaeus, 1758) for a Holarctic species of aphodiine dung beetle. Since a different species has been erroneously designated as the lectotype, it is proposed that the previous type fixations for the species *Aphodius fimetarius* (Linnaeus, 1758) be set aside and a neotype consistent with the current usage be designated. Given that the species diagnostic morphological characters show variation overlapping with those of the most similar species, *Aphodius pedellus* (De Geer, 1774), we suggest a modern, chromosomally determined specimen as the neotype.

Keywords. Nomenclature; taxonomy; SCARABAEIDAE; APHODIINAE; *Aphodius*; *Aphodius fimetarius*; *Aphodius pedellus*; *Aphodius foetens*; dung beetle; Recent; Holarctic.

1. Linnaeus (1758, p. 348) described *Scarabaeus fimetarius* from Europe ('Habitat in Europae stercoratis') and referred to Frisch (1736), Rösel (1749), Uddman (1753) and his own works *Fauna Svecica* (Linnaeus, 1746) and 'Iter Oelandicum' which is *Öländska Resa* (Linnaeus, 1745). According to Article 72.4.1 of the Code, the type series comprises the material considered by those authors together with the original Linnaean material present in the Linnaean collection housed by the Linnean Society of London. With the type locality determined by Linnaeus as Europe, the specimens of the type series originated primarily from Sweden and Germany. Sweden at the time owned parts of northern Germany. It should be noted that the type series included more than one species: '*A. fimetarius*' = *A. pedellus* (De Geer, 1774), sensu Wilson (2001; see para. 2 below); *A. foetens* (Fabricius, 1787) (see para. 3 below);

potentially a sibling species formerly subsumed under *A. fimetarius* (*A. fimetarius* sensu Wilson, 2001, see para. 2 below); possibly *A. foetidus* (Herbst, 1783) (Linnaeus's variety β , synonymised with *Aphodius scybalarius* Fabricius by Schönherr (1806, p. 68), which he misidentified; *A. scybalarius* was mistakenly used for *A. foetidus* by several authors, see BZN 51: 121–127); or even *Aphodius sordidus* (Fabricius, 1775), which occurs in Öland from where Linnaeus (1746) described it and which can have four dark dots on the elytra as indicated by Uddman (1753) (see Ljungberg & Hall, 2009). Landin (1956) came to the same conclusions, but missed the presence of one *A. foetens* in the Linnaean material. Despite this inconsistent type series, the usage of *Aphodius fimetarius* had been consistent and undisputed for at least a century until 2001. It is the type species of the genus *Aphodius* Hellwig, 1798, designated by Latreille (1810).

2. Wilson (2001, p. 137), in the course of her PhD research, found that *Aphodius fimetarius* (Linnaeus, 1758 p. 348), as used by all authors in the preceding hundred years, comprises two species clearly separable on their karyotypes. She reported on relevant type material and designated lectotypes for *Scarabaeus fimetarius* Linnaeus, 1758 (p. 348), and *Scarabaeus pedellus* De Geer, 1774 (p. 266), which she considered to be the correct names for the two species.

3. Unfortunately, neither Wilson (as author of the paper) nor Angus (as supervisor of Wilson's PhD) had checked the underside of Linnaeus's specimens, and it now transpires that the chosen lectotype of *S. fimetarius* belongs to *Aphodius foetens* (Fabricius, 1787, p. 8), immediately recognisable by its red abdomen.

4. The species with a red abdomen has never been referred to *A. fimetarius* (Linnaeus), being known as *A. aestivalis* Stephens, 1839 (e.g. Kloet & Hincks, 1945; Britton, 1956; Balthasar, 1964), *A. vaccinarius* Herbst, 1789 (e.g. Paulian, 1959) or by the currently used name of *A. foetens* (Fabricius) (e.g. Thomson, 1863; Fowler, 1890; Joy, 1932; Machatschke, 1969; Jessop, 1986; Baraud, 1992; Krell & Fery, 1992; Dellacasa, G. & Dellacasa, M., 2006). Although Linnaeus described *S. fimetarius* as having a black body and red elytra, it is not possible to demonstrate that the specimen chosen by Wilson (2001) as lectotype was not part of Linnaeus's original material of *S. fimetarius* as Linnaeus gave no indication of knowing a species with a red abdomen as well as red elytra. In fact, it is clear from Wilson's account of the Linnaean material that this specimen does form part of Linnaeus's series, and the most likely explanation is that Linnaeus did not notice its red abdomen. Therefore the Commission is asked to use its plenary power to set aside the current lectotype and replace it with a neotype (as proposed in para. 6 below), as required by Article 75.6 of the Code.

5. The present interpretation of *A. fimetarius* and *A. pedellus* (sensu Wilson, 2001) is in use by those authors who have recognised that the former *A. fimetarius* comprises two species, notably Whitehead (2005, 2006) who keys out the two species, Mann in Lane et al. (2002), Denton (2005), Dellacasa, M. & Dellacasa, G. (2006), Ljungberg (2006), Rössner (2006), Mann (2006, 2008), Darby (2009), Nilsson (2009), Roslin & Heliovaara (2009), Forshage (2010), and Ljungberg & Hall (2009) who key and illustrate *A. pedellus* as a member of the Swedish fauna. *Aphodius pedellus* has been entering the ecological and conservation literature (Ljungberg & Vessby, 2009; Stenström & Holmberg, 2010; Ødegaard et al., 2011). The current American use of *Aphodius fimetarius* (e.g. Gordon & Skelley, 2007) includes both sibling species (from

Californian material chromosomally identified by Wilson & Angus, 2004, and newly studied Arizona and Colorado material (R. B. Angus, unpublished karyotype), both belonging to *A. fimetarius* sensu Wilson; *A. pedellus* is identified from several States (Krell, unpublished).

6. Choice of neotype: Recommendation 75A of the Code is that a neotype should if possible be chosen from surviving paralectotypes unless there are compelling reasons to the contrary. In the present case, because all possible species diagnostic characters show overlapping variation (colour, tip of elytra, pronotal punctures, genae, aedeagus), karyotypic data are necessary to allow unequivocal identification, so that the choice of a modern, chromosomally determined specimen is justified. Although the paralectotypes on the Linnaean series are considered inadequate for neotype designation, they are among the material available to guide the choice of the species to be defined by the neotype. However, it should be noted that this material does not constitute the total available for consideration (see para. 1 above). Both Frisch (1736) and Rösel (1749) discussed and figured the *Aphodius* with red elytra, and are concerned with German material which becomes part of the basis for interpretation of *A. fimetarius*. Linnaeus's own *Fauna Svecica* (1746) explicitly refers to the Swedish Realm, which at that time included parts of northern Germany. This is important as while only *A. pedellus* is known in present day Sweden, both *A. pedellus* and *A. fimetarius* sensu Wilson occur in Germany, and Linnaeus gave Europe, not Sweden, as the type locality for his *Scarabaeus fimetarius*. Wilson (2001), in her account of the Linnaean series, mentions, as well as the specimen designated lectotype, four Linnaean specimens, two males and two females, as well as one non-Linnaean English specimen. Wilson identified one Linnaean male and one female as *A. fimetarius* (Linnaeus) in the sense adopted in her paper, and one male and one female as *A. pedellus* (De Geer). Further study of the material shows this to be not entirely correct. All the specimens were coated with a fine partly greasy layer and this gave their surface sculpture a muted appearance. Angus has now cleaned the material and as a result of this it is clear that both of the females, as well as one male, are *A. pedellus* (De Geer). The remaining male, which has the Linnean Society's catalogue number 3385 and is the male on the finer pin, at one time pinned immediately to the right of Linnaeus's name label, may be *A. fimetarius* (Linnaeus) as interpreted by Wilson (2001), as the head has the cheeks not expanded laterally in front of the eyes, their lateral margins being parallel to one another posteriorly. However, the pin of this specimen is not a typical Linnaean pin (Mikkola, 1983) which allows for the possibility that it is not an original Linnaean specimen. Dissection of the aedeagus might clarify the identification of this specimen but is considered unnecessary as the specimen is not adequate for designation as neotype. Despite the existing paralectotypes very probably lacking a specimen of *A. fimetarius* sensu Wilson, it is possible that Frisch's or Rösel's material referred partly to this species. Both Frisch's and Rösel's collections are probably lost (see Horn et al., 1990). The least disruptive choice of neotype is a specimen corresponding to Wilson's (2001) interpretation of *A. fimetarius*, followed by those who have recognised that two species are involved (see para. 5) and that is the procedure adopted here.

7. Neotype designation. Neotype ♂ *Scarabaeus fimetarius* Linnaeus 1758. The specimen is mounted on Bristol board using gum tragacanth, though for added



Fig. 1. *Scarabaeus fimetarius* Linnaeus, 1758. Proposed neotype.

strength the aedeagus is glued to the face of the card with 'Hercules' water-soluble glue. It is labelled 'England, E. Kent. Deal. 10.v.2000. Wilson, Angus & Carr.' and 'Chromosome prep. 1: 10.v.2000.' It is housed in the Coleoptera collection of

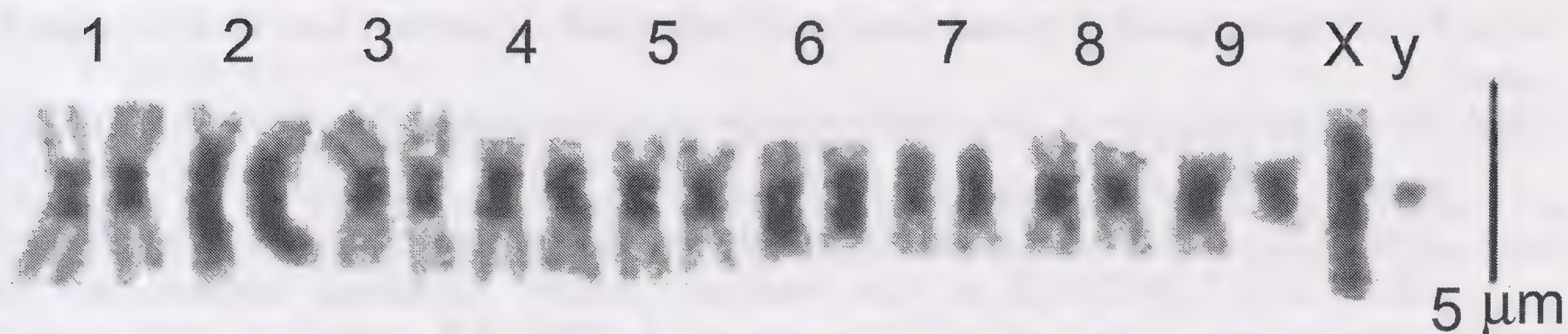


Fig. 2. *Scarabaeus fimetarius* Linnaeus, 1758. Mitotic chromosomes from mid-gut cell of proposed neotype, arranged as a karyotype.

the Natural History Museum, London and has the unique identification label BMNH{E}UIN990028. It is illustrated in Fig. 1 and a C-banded karyotype prepared from mitotic chromosomes from mid gut of this specimen is shown in Fig. 2.

Its length is 7.0 mm, its breadth 3.4 mm. The head is shining black with the frontoclypeal suture strongly trituberculate. The cheeks do not protrude laterally in front of the eyes and their lateral margins are not divergent from the base, so that they are more or less parallel to one another on each side of the head. The antennae are reddish brown. The pronotum is shining black, with yellowish red patches at anterior angles. The anterior margin has a distinct median impression and the posterior margin is entirely bordered. The hind angles are obliquely truncate. The pronotal puncturation is double, with sparse, even, fine punctures over the entire surface, but the coarser punctures are more restricted, diffuse over most of the surface but absent from an area behind the anterolateral pale patches and very sparse over the median part of the anterior quarter. The scutellum is small, triangular, black, sparsely punctuate except for the impunctate apical third. The elytra are yellowish red with the interstices weakly but distinctly convex. Interstice 4 (between striae 3 and 4) on the left elytron is about as long as interstice 3, but on the right elytron it is distinctly shorter than interstice 3. On both elytra it is as long as interstice 5 and extends to the reticulate apical section of the elytra (the subapical field) which extends between the apices of striae and interstices 1 – 6 and the apical margin of the elytra. The subapical field is flat, matt, with even, fine reticulation and scattered fine punctures, without any wrinkles. The legs are blackish brown, with the tarsi paler, reddish brown. The aedeagus in lateral view has the apices of the parameres deflexed at almost a right angle.

A C-banded karyotype from mitotic chromosomes of a mid gut cell of this beetle is shown as Fig. 3 by Wilson (2001) and as Fig. 48.2 by Angus (2006).

Designation of this neotype conforms to the interpretation of *Scarabaeus fimetarius* Linnaeus used by Wilson (2001) and those authors who have considered *Aphodius fimetarius* and *A. pedellus* (De Geer) to be separate species.

8. Strict application of the Code without asking the Commission to apply its plenary power would mean transferring the name *Aphodius foetens* from one fairly well known species to one of the most common Holarctic dung beetle species, which would cause immense confusion. Choosing a neotype from the paralectotypes of *Aphodius fimetarius* would acknowledge the species identity of probably most of the specimens that Linnaeus had in hand when describing *S. fimetarius*, but would go against the use by those authors who have recognised that the former *A. fimetarius* comprises two species (see para. 5 above).

9. The International Commission on Zoological Nomenclature is accordingly asked:

- (1) to use its plenary power to set aside all previous type fixations for the nominal species *fimetarius* Linnaeus, 1758, as published in the binomen *Scarabaeus fimetarius*, and to designate the specimen with the unique identification label BMNH{E}UIN990028 at the Natural History Museum, London, as the neotype;
- (2) to place on the Official List of Specific Names in Zoology the name *fimetarius* Linnaeus, 1758, as published in the binomen *Scarabaeus fimetarius*, and as defined by the neotype designated in (1) above.

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